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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/808,802

03/25/2004

Fu-Kai Yang

TS03-186

6030

7590

08/03/2004

STEPHEN B. ACKERMAN
28 DAVIS AVENUE
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EXAMINER

GURLEY, LYNNE ANN

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 08/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/808,802

Applicant(s)

YANG ET AL.

Examiner

Lynne A. Gurley

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-29 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-29 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

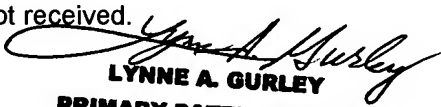
Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.


LYNNE A. GURLEY
PRIMARY PATENT EXAMINER
TC 2800, AU 2812

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 4/29/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chang et al. (US 6,642,153, dated 11/4/03, filed 7/31/02) in view of Nagahara (US 2002/0192945, dated 12/19/02).

Chang shows the method as claimed in figures 2-3 and corresponding text, with conductive structure 20; insulator stack 22A (first liner layer), 24A (first insulator layer), 22B (second liner layer), 24B (second insulator layer) and 26 (antireflection layer); via opening 28A (fig. 2B); trench opening 28B and resist plug 30; removing portion of the second liner layer (fig. 2D-2F); removing the photoresist shape and plug (fig. 2E); removing portion of the first liner layer exposed in the via opening, exposing a portion of a top surface of the conductive structure (fig. 2F). The photoresist plug is removed using plasma oxygen ashing procedures.

Chang lacks anticipation only in not teaching a capping layer; deposition of the liner layers and insulating layers by PECVD; RIE etching procedures, etchants and etch rate ratios; and, via opening diameter.

Nagahara teaches, in a similar method, the use of a capping layer in conjunction with an antireflection layer in patterning a dual damascene contact, which also uses a sacrificial photoresist plug to protect the via during processing.

It would have been obvious to one of ordinary skill in the art to have incorporated the capping layer, in the method of Chang, as taught in the method Nagahara, with the motivation that the capping layer would provide additional protection to the uppermost insulating layers

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against moisture, impurities as is conventional in the art. Additionally, the cap layer would not interfere with the use or benefits of the antireflection layer and the claimed insulating layers of the instant invention.

It would have been obvious to one of ordinary skill in the art to have had the deposition of the liner layers and insulating layers be by PECVD; to have used RIE etching procedures, etchants and etch rate ratios to etch the via and trench contact holes and the claimed layers associated therewith; and, to have had the claimed via opening diameter, in the method of Chang, with the motivation that it is well known to one of ordinary skill in the art to use PECVD, as an alternative to the LPCVD used in Chang, to deposit the claimed layers, as it is also well known to use RIE procedures and to have the claimed via diameter, barring some expression of criticality.

6. Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Harada et al. (US 6,251,774, dated 6/26/01) in view of Nugahara (US 2002/0192945, dated 12/19/02).

Harada shows the method as claimed in figures 1-4 and corresponding text, with emphasis on figure 4, with conductive structure 30; insulator stack 32 (first liner layer), 34 (first insulator layer), 36 (second liner layer), 38 (second insulator layer) and 58 (antireflection layer); via opening 46 (fig. 4C); trench opening 54/56 and resist plug 48; removing portion of the second liner layer (4E); removing the photoresist shape and plug (fig. 2E); removing portion of the first liner layer exposed in the via opening, exposing a portion of a top surface of the conductive structure (fig. 2F).

Harada lacks anticipation only in not teaching a capping layer; deposition of the liner layers and insulating layers by PECVD; RIE etching procedures, etchants and etch rate ratios; that the photoresist plug is removed using plasma oxygen ashing procedures; and, via opening diameter.

Nagahara teaches, in a similar method, the use of a capping layer in conjunction with an antireflection layer in patterning a dual damascene contact, which also uses a sacrificial photoresist plug to protect the via during processing. Nagahara also teaches removal of photoresist by oxygen ashing procedures.

It would have been obvious to one of ordinary skill in the art to have incorporated the capping layer and the oxygen ashing procedure, in the method of Harada, as taught in the method Nagahara, with the motivation that the capping layer would provide additional protection to the uppermost insulating layers against moisture, impurities as is conventional in the art. Additionally, the cap layer would not interfere with the use or benefits of the antireflection layer and the claimed insulating layers of the instant invention. The oxygen ashing procedure is conventional as taught in Nagahara, enabled by Harada, with the acknowledgement that conventional procedures may be used.

It would have been obvious to one of ordinary skill in the art to have had the deposition of the liner layers and insulating layers be by PECVD; to have used RIE etching procedures, etchants and etch rate ratios to etch the via and trench contact holes and the claimed layers associated therewith; to have removed the photoresist using oxygen ashing procedures; and, to have had the claimed via opening diameter, in the method of Harada, with the motivation that it is well known to one of ordinary skill in the art to use PECVD, as an alternative to the LPCVD

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used in Harada, to deposit the claimed layers, as it is also well known to use RIE procedures and, to have the claimed via diameter, barring some expression of criticality.

Claims 1-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Stamper (US 6,297,149, dated 10/2/01) in view of Nugahara (US 2002/0192945, dated 12/19/02).

Stamper shows the method as claimed in figure 4 and corresponding text, with conductive structure 304; insulator stack 305 (first liner layer), 307 (first insulator layer), 309 (second liner layer), 311 (second insulator layer) and 313 (antireflection layer); via opening 315 (fig. 4C); trench opening 405 and sacrificial plug 401; removing portion of the second liner layer (4E); removing the photoresist shape and plug (fig. 4F); removing portion of the first liner layer exposed in the via opening, exposing a portion of a top surface of the conductive structure (figs. 4F-4G).

Stamper lacks anticipation only in not teaching a photoresist plug, a capping layer; deposition of the liner layers and insulating layers by PECVD; RIE etching procedures, etchants and etch rate ratios; that the photoresist plug is removed using plasma oxygen ashing procedures; and, via opening diameter.

Nagahara teaches, in a similar method, the use of a capping layer in conjunction with an antireflection layer in patterning a dual damascene contact, which also uses a sacrificial photoresist plug to protect the via during processing. Nagahar also teaches removal of photoresist by oxygen ashing procedures.

It would have been obvious to one of ordinary skill in the art to have incorporated the capping layer and the oxygen ashing procedure, in the method of Stamper, as taught in the

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method Nagahara , with the motivation that the capping layer would provide additional protection to the uppermost insulating layers against moisture, impurities as is conventional in the art. Additionally, the cap layer would not interfere with the use or benefits of the antireflection layer and the claimed insulating layers of the instant invention. The photoresist plug would serve the same purpose as the filler plug in Stamper. The oxygen ashing procedure is conventional as taught in Nagahara, enabled by Stamper, with the acknowledgement that conventional procedures may be used.

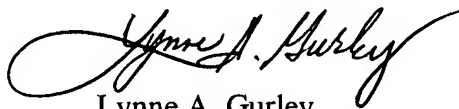
It would have been obvious to one of ordinary skill in the art to have had the deposition of the liner layers and insulating layers be by PECVD; to have used RIE etching procedures, etchants and etch rate ratios to etch the via and trench contact holes and the claimed layers associated therewith; to have removed the photoresist using oxygen ashing procedures; and, to have had the claimed via opening diameter, in the method of Stamper, with the motivation that it is well know to one of ordinary skill in the art to use PECVD, as an alternative to the LPCVD used in Stamper, to deposit the claimed layers, as it is also well known to use RIE procedures and, to have the claimed via diameter, barring some expression of criticality.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynne A. Gurley whose telephone number is 571-272-1670. The examiner can normally be reached on M-F 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling can be reached on 571-272-1679. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Lynne A. Gurley
Primary Patent Examiner
TC 2800, Art Unit 2812

LAG
July 30, 2004